PALYNOLOGY, SOURCE ROCKS AND MATURITY IN GREENSLOPES-1, 1367-2562m

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C O N T E N T S

I. SUMMARY

Palynological analysis of 21 sidewall cores from Greenslopes-1 (PEP-101) indicates the following subdivisions:-

1367-1381	*P.parvispinosus*	Early Aptian	Brackish to Non-marine
1567-1816	*F.asymmetricus*	Barremian - Early Aptian	Non-marine
1853	*F.wonthagiensis*	Valanginian - Barremian	Non-marine
1963-2536	*C.hughesi*	Berriasian - Valanginian	Non-marine to Brackish
2556	*C.hughesi*	Berriasian - Valanginian	Marginal Marine
2562	*C.hughesi*	Berriasian - Valanginian	Non-marine

Eight samples between 1816m to 2536m proved on kerogen analysis to have sufficient organic matter, particularly unoxidised liptinites, to be regarded as being possible good oil source rocks. The remaining samples had insufficient liptinites to have any significant potential.

From 1367m to 1381m was immature for the type of source rocks encountered in the well. The section from 1567m to 2443m had light orange spore colours regarded as mature for early oil generation. From 2490-2562m spore colours were orange indicating the zone of peak oil generation.

II. INTRODUCTION

Greenslopes No.1 was drilled in PEP-101, Otway Basin by Phoenix Oil and Gas N.L. A total of 21 sidewall cores from 1367m to 2562m were submitted for palynological analysis to determine ages and environments of deposition and to determine source rock potential and maturity.

III. PALYNOLOGY AND ENVIRONMENTS

The samples were prepared using standard methods and yields were generally good. The palynomorphs recorded are shown in Enclosure 1 and a summary of the zones, ages and environments is given in Table 1.

Four palynological zones are recognised in the sequence and they correlate with the unpublished biostratigraphic Units of CSR Oil and Gas Division (1985). The ages for the zones are derived from published and unpublished data.

1367m, 1373m and 1381m — *Pilosisporites parvispinosus* Zone
Early Aptian

The presence of *Pilosiporites parvispinosus* and *Foraminisporis asymmetricus* and the absence of any younger species indicates a correlation to the *P.parvispinosus* Zone (ECL unpublished) which is equivalent to Unit PK 3.2 of CSR (unpublished).

Micrhystridium sp. at 1367m suggests a brackish environment but the other two samples were deposited in a non-marine environment.

1567m, 1381m — *Foraminisporis asymmetricus* Zone
Berremian - Early Aptian

The first appearances of both the nominate species and *Pilosisporites notensis* correlates the assemblages with the *F.asymmetricus* Zone (ECL unpublished) that is equivalent to Unit PK 3.1 (CSR unpublished). Both samples indicate a non-marine environment.

1853m — *Foraminisporis wonthagiensis* Zone

The presence of the nominate species and absence of any younger species indicates a correlation to the zone, equivalent to Unit PK 2 (CSR unpublished). No marine indicators were observed in the sample.

1963m-2562m — *Cyclosporites hughesi* Zone
Berriasian - Valanginian

The spore-pollen assemblages in this sequence were generally not well preserved and low in diversity. They were characterised by *Cicatricosisporites australiensis*, Dictyotosporites *speciosus*, *Cyclosporites hughesi*, *Neoraistrickia truncata* and *Retitriletes solidus*.

A species conformable with *F. wonthagiensis* in the deepest sample (2562m) is disregarded as a possible mud contaminant, although no other evidence for this was apparent.

The absence of *Foraminisporis wonthagiensis* (except as mentioned above) correlates the assemblage to the *C. hughesi* Zone (ECL unpublished) equivalent to Unit PK 1.2 (CSR unpublished).

Samples at 1977m, 2214m, 2265m and 2307m had rare *Micrhystridium* sp. that suggests deposition in a brackish water environment. At 2556m relatively common *Microfasta evansii* suggests deposition in a marginal marine environment. The remaining samples in the sequence are regarded as non-marine.

IV. SOURCE ROCK POTENTIAL

The methods used to estimate source rock potential from palynological residues is discussed in Appendix 1. The results of the analyses are shown in Tables 1 and 2 and the inferred potentials are summaried in Table 1. The primary criteria used to assess source rock potential are total organic matter measured as Volume of Organic Matter (VOM in ml/10g), the abundance of the various liptinites, the oil index and the volume of unoxidised (fluorescent) liptinites. Seven of the samples had VOM values of less than 0.3ml and two others had very low yields of unoxidised liptinites and these are not considered any further. Eight samples are suggested as having possible good potentials to generate liquid hydrocarbons and the remainder are regarded as having possible moderate potentials.

Most of the samples here indicated as having good source rock potentials are just at the threshold of this category as the overall abundances of unoxidised liptinites as measured by volume of fluorescent liptinites and amorphous sapropel are not high. This reflects the generally oxidising environments in which the organic matter was deposited. The samples that are here identified as having possible good oil potentials must be correlated with the electric logs to determine whether any significant sections of potential source rocks are present in the well.

V. MATURITY

The techniques used to assess spore colours and UV fluorescence colours in the samples are discussed in Appendix 1. The observed colours are shown in Table 3 and the interpreted maturity levels for oil generation are shown in Table 1.

1367m-1381m Very early oil

Fluorescence colours of light yellow and spore colours of yellow to light orange are at a level where some source rocks can begin to generate oil but in this well the section is immature.

1567m-2443m Early oil

Light orange spore colours and yellow fluorescence colours correlate with a VRE of approximately 0.5% to 0.6% that is regarded as generally capable of generating oil.

2490m-2562m Peak oil

Spore colours of orange and fluorescence colours of gold to orange indicate the zone of main oil gneration at a VRE of approximately 0.7%. The deepest sample would suggest a slightly higher maturity level but as the palynomorphs were severely oxidised the colours are not reliable.

TABLE NO.1.

Palynological zones, ages, environments of deposition, oil potential and maturity in Greenslopes-1.

DEPTH (m)	PALYNOLOGICAL ZONE	AGE	ENVIRONMENT OF DEPOSITION	OIL POTENTIAL	MATURITY
1367.0	P. parvispinosus	Early Aptian	Brackish	Moderate	Very early oil
1373.0	P. parvispinosus	Early Aptian	Non-marine	Poor	Very early oil
1381.0	P. parvispinosus	Early Aptian	Non-marine	Moderate	Very early oil
1567.0	F. asymmetricus	Barremian-Early Aptian	Non-marine	Poor	Early oil
1816.0	F. asymmetricus	Barremian-Early Aptian	Non-marine	Good	Early oil
1853.0	F. wonthagiensis	Valanginian-Barremian	Non-marine	Good	Early oil
1963.0	C. hughesi	Berriasian-Valanginian	Non-marine	Poor	Early oil
1977.0	C. hughesi	Berriasian-Valanginian	Brackish	Good	Early oil
2172.0	C. hughesi	Berriasian-Valanginian	Non-marine	Poor	Early oil
2214.0	C. hughesi	Berriasian-Valanginian	Brackish	Moderate	Early oil
2265.0	C. hughesi	Berriasian-Valanginian	Brackish	Good	Early oil
2283.0	C. hughesi	Berriasian-Valanginian	Non-marine	Poor	Early oil
2307.0	C. hughesi	Berriasian-Valanginian	Brackish	Good	Early oil
2365.5	C. hughesi	Berriasian-Valanginian	Non-marine	Poor	Early oil
2436.0	C. hughesi	Berriasian-Valanginian	Non-marine	Good	Early oil
2443.0	C. hughesi	Berriasian-Valanginian	Non-marine	Poor	Early oil
2490.0	C. hughesi	Berriasian-Valanginian	Non-marine	Poor	Peak oil
2505.0	C. hughesi	Berriasian-Valanginian	Non-marine	Good	Peak oil
2536.0	C. hughesi	Berriasian-Valanginian	Non-marine	good	Peak oil
2556.0	C. hughesi	Berriasian-Valanginian	Marginal marine	Moderate	Peak oil
2562.0	C. hughesi	Berriasian-Valanginian	Non-marine	Poor	Peak oil